

Start Up: (5-10 min) Samples of various fungi, lichens and galls to observe, related posters
The Pretzel (Sanborn)-Students stand in a circle and hold hands across the circle with two different people, then attempt to untangle the human knot into a regular hand-holding circle. Start with three or more people, then make larger “knots” as more students arrive. Share with students how their tangled knot is similar to the interactions between plants and other organisms they are connected with in nature.

Welcome/ Staff/Volunteer Names
Introduction: **Today’s Topic-Plant Interactions**
1 min. **Question: How do plants interact with other plants and animals?**

Opener: **Iowa Buddies** (*Project Wild, 3-5 Symbiosis*)-
10 min. Give each group of 5 or 6 students one set of symbiotic pair cards.

- Ask a student from each group to deal all cards.
- Each player draws one card from the player on his/her left, then lays down any matches.
- Play until someone in the group has no cards left.

Post an enlarged buddy pair chart to help students make matches.

Background/ Usually we study animals, or plants, or one subject at a time.
Exploration: Plants are affected by other plants, fungi, and insects in many ways.
45 min. We will think about interactions in nature, including symbiotic relationships.

Read aloud to highlight the descriptions of the following relationships and have the students try to guess which title fits (see cards below):

Predators and prey live in interdependence.

- Predators thin the prey species’ population and make it a healthier group.
- The prey provides food for the predator.
- This is a balance of effects, but not a close (dependent) relationship.

Examples: Fox-Rabbit; Hawk-Mouse; Owl-Rodent.

Plant predators/carnivorous plants include pitcher plants, sundews, and venus fly traps.

Competition occurs frequently in nature between many combinations of species.

- Plants compete with other plants of the same and different species for air, soil, water, light, and space. This competition may be more or less intense depending on conditions.
- One competitor usually wins, one may die, or each adapts to the situation.
- Plants have adapted to avoid being eaten by growing spines or thorns, or producing chemical substances which repel, inhibit, or poison other plants (animals, and people).
Black Walnut husks make juglans, which inhibits seed germination among other plants to reduce competition.

Symbiosis means different organisms living together in close association.

This relationship between two species may be helpful to both, neutral for one or both, or harmful to one.

- If it is helpful to both species, it is called **mutualism**.
- If it is neutral to one species, it is **commensalism**.
- If the association between species harms one of them, it is **parasitism**.

Activity:

15 min.

Iowa Buddies cont':

Using one set of cards, give each student a card from the symbiotic pairs.

- ♣ Students match up with their “buddy”.
- ♣ Give each pair the background card on their symbiotic relationship to facilitate “research” and answer questions.
- ♣ Students decide if their relationship is commensalisms, mutualism, or parasitism.
- ♣ Student pairs share main points about their buddies’ relationship with the group.
- ♣ Ask the students to think of more examples of symbiosis found in Iowa (3-5 *Symbiosis*).

Look on a woodland poster for examples of each type of relationship.

Explain the following examples of symbiosis to students.

Discuss (see 3-5 *Symbiosis* for details).

Lichens (Mutualism)-Symbiotic association of a certain alga and a certain fungi.

Mycorrhizae (Mutualism)-Many (all?) plants have fungal threads associated with them, which makes it easier to absorb nutrients due to the increased surface/volume ratio.

Galls-Out of place bumps or swellings on plants are probably galls.

Parasitic Plants-Show pictures of plant parasites like Cancerroot, Indian Pipe, & Dodder. These plants have no chlorophyll, and must get their food from other plants/fungus.

Indian Pipe is actually saprophytic, like some fungi, it is not a parasite.

(A saprophyte gets nutrition from dead organisms, a parasite from living organisms.)

Humans create categories to better understand nature, but plants have many exceptions to our “rules”. They tend to blur the boundaries of our categories.

Prepare to go Outside:

5 min.

Restroom break.

Bring: Water bottles, hats, jackets, clipboard/clip

Trail Rules (see The First Program).

What we will do/What to look for-Galls, fungus, plant parasites

Predictions-How many different kinds of galls will we find?

OUTDOOR**EXPLORATION:**

90 min.

Hike through woods, prairie, etc. Look for evidence of plant interactions:

Shelf fungus, mushrooms, lichens, galls, predators, parasites, & competition.

Activity:

Gall Hunt-Look for different shaped galls on goldenrod, tree leaves, etc.

800/2000 kinds of American galls are found on oaks.

- ♣ Look on oak, willow, hickory, cottonwood, poplar & cherry trees; blackberry & rose bushes.
- ♣ Have the students try to find holes in the gall from emerged insects.
- ♣ Do they find any large holes from predation of the larva/pupa?
- ♣ Cut open some goldenrod or other galls to find the larva or pupa, and the exit tunnel made by the larvae for its escape in the spring.

Record where the galls were found and their shape (see 3-5 *Symbiosis*).

Use a gall hunt sheet to determine the origins of some galls (Miller, Extension).

Lichen observation-

- Grow slowly in direct sunlight, shrink and swell with changes in moisture.
- Shrinking/swelling wears away bits of rock or bark, the fungus dissolves minerals from the rock or bark with acids.
- Bits of rock and dead lichen eventually form soil.
Mosses can then begin to colonize the area.

Can you tell whether soil is beginning to form under the lichens?

Game: Play **Fox & Rabbit** (see *HS-1: 3-5 Tallgrass Prairie*) or another predator-prey game.
15 min.

Closing: Remember when you look at plants that they are connected to other species in many ways!

Send Off: Goodbye!
Next Month-Resource Management

Take Home: Parent outline
Background
At-home activities

Vocabulary

Symbiosis, gall, lichen, mutualism, commensalism, parasitism, carnivorous, competition, mycorrhizae, interdependence, saprophyte, interaction

Background and Activity References for Naturalists and Parents

- Abdi, S.Wali, "Survival Through Symbiosis", *The Science Teacher*, January 1992, pp. 22-27.
- An Iowa Supplement to Project Learning Tree: K - 8*. 1993. Iowa Department of Natural Resources, Des Moines. Pp. 68-70 Fallen Log Investigation and worksheets
- Caduto, M. J., and J. Bruchac. 1988. *Keepers of Life: Discovering Plants Through Native American Stories and Earth Activities for Children*. Fulcrum, Inc. Golden, CO. P. 77 Mycorrhizae; P. 80 lichens; pp. 182-184 symbiosis, galls, chemical interactions; p. 191 gall activities
- Durrell, Gerald. 1986. *A Practical Guide for the Amateur Naturalist*. Alfred A. Knopf, New York. P. 121 Drawing of Oak galls, information on galls
- Home School EE Program Series: Year 1*. 2005. Indian Creek Nature Center, Cedar Rapids, IA. P. 72 Fox & Rabbit game
- Insect Galls on Trees and Shrubs*. 2004. Iowa State University Extension, Ames. (IC-417) Extension Publication <http://www.extension.iastate.edu/> Gall guide w/some diagrams
- Lingelbach, Jenepher. 1986. *Hands-On Nature: Information and Activities for Exploring the Environment with Children*. Vermont Institute of Natural Science, Woodstock, VT. Pp. 83-85 Galls
- Miller, Lenore Hendley. 1986. *The Nature Specialist*. American Camping Association, Martinsville, IN. P. 105 Common galls and their inducers (by season)
- Project Wild: Activity Guide*. 1992. Ed. Staff. Western Regional Environmental Education Council, Inc., Bethesda, MD. Pp. 104-107 Good Buddies-card game about symbiosis
- Ranger Rick's Naturescope :Incredible Insects*. 1989. National Wildlife Federation, Washington, D.C. P. 31 Getting into Galls
- Sanborn, Jane. 1984. *Bag of Tricks: 180 Great Games*. Search Publications, Florissant, CO. P. 29 The Pretzel

Extensions/Alternate Activities/Rainy Day

Invite a fungus expert to visit the program and share their knowledge with students.

Share the life history of the goldenrod gall fly (*Eurosta solidaginis*) with students (see 3-5 *Symbiosis*).

Climate, soil, slope, and other growing conditions shape the **plant communities** in various geographic regions. There are countless interactions between the plants and animals in each area.

Study variations in sun, soil moisture, and vegetation with the **Mexico to Alaska** activity (see *HS-1: 3-5 Flowering Plants*).

Mycorrhizae Investigation-Dig in an inconspicuous spot in a prairie to allow students to look for signs of root interactions.

Fallen Log Hunt (*Iowa Supplement to Project Learning Tree*)-Roll a decaying log over and look for fungus, lichens, etc.

Supplies:

Pictures of lichens

Pictures of parasitic plants

Samples of lichen, fungi

Magnifiers

Woodland Poster

Gall Hunt Sheet

Pocket knife for opening galls

IA/Good Buddies pair cards

IA/Good Buddies background cards

Clipboards

Pencils

Advance

Preparation:

Make a reference sheet for the gall hunt by copying the ISU Extension information and the oak gall pictures. Page protectors can be used to extend the life of the sheets.

Collect some galls, lichens, and fungi for students to observe before the hike.

Copy the **Iowa Buddies** pair cards and background sections onto cardstock and cut apart.

Copy the gall hunt record sheet.

Species Relationship Description Cards:

(Copy, cut apart horizontally, and fold in 1/2).

Two species live in interdependence
One species thins the other species' population
The second species provides food for the first
A fluid balance, not a close relationship

Predators and Prey

Occurs frequently between many species
Plants vie with other plants for air, soil, water,
light, and space
Different animals may need the same food, water,
or space
More or less intense depending on conditions
One species wins, one may die, or each adapts

Competition

Different organisms living together in close
association. This relationship between two species
may be helpful to both, neutral for one or both, or
harmful to one.

Symbiosis

A close association helpful to both species

mutualism

An association neutral to one, helpful to another

commensalism

The association between species harms one
includes many diseases

parasitism

