

LESSON 2: Earth's Recyclers

Unit Theme: The mushroom life cycle.

Conceptual Lens: Decay and renewal

Concepts: Decomposition, mutualism

Vocabulary (Assign one word to a group of 5-6 students and have them report to the class):

[Consumers](#)

[Dispersal](#)

[Mycorrhizal symbiosis](#)

[Parasite](#)

[Saprophyte](#)

Enduring Understandings:

- Mushrooms reproduce by disseminating spores.
- Some fungi act as decomposers, while others form symbiotic relationships with the roots of other plants.
- Mycologists collect information about fungi by doing research. Research is a critical component of fieldwork.

Guiding Questions:

1. Since mushrooms are not plants or animals, how do they reproduce?
2. What is decomposition?
3. What happens to organic materials like dead wood and leaves?
4. Can you think of some non-fungus examples of scavengers, parasites or saprophytes?

Critical Content:

Fungi reproduce asexually by disseminating spores. Mushrooms, along with bacteria and molds, break down waste materials. They are known as scavengers, saprophytes or parasites. A scavenger is an organism that feeds off of another dead organism, in this case, usually dead wood. Saprophytes are mushrooms that have a give-and-take relationship with a plant. A parasitic fungus is one that uses another plant's nutrients and resources without benefiting the plant.

Skills:

Illinois: Science 11A; Social Science 17C; Language Arts 1C

National: Science 9-12.1, Language Arts 12.7, 12.8; Technology 12.3, 12.5

Instructional Activities & Methods:

1. Begin by having students take a spore print using the "How to Take a Spore Print" handout, in order to understand what the reproductive spores look like. Purchase mushrooms at the grocery store: make sure they have gills and are whole (buttons work well as long as they are mature). Bring in enough mushrooms for students to

conduct their own exercise, or print out the directions and have them complete the assignment at home.

2. Present the Mushroom Life Cycle diagram on the overhead.

Fungi begin their life cycle as spores, released into the environment by a mature mushroom. The spores are carried by wind or are redeposited by an animal. Once the spores are in a resting state, a fine web of mycelium begins to cover the spores. Growing at a rapid pace, mycelium gains nutrients and continues to develop into a network, eventually forming into tight, circular colonies. These small colonies begin to emerge from the web of mycelium and are known as mushroom primordium. From mycelium to primordium, the process only takes a few days to a week or two. From the primordium, the fruiting body, or mushroom, begins to grow. As the fruitbody grows, the parts of the mushroom develop. If it is a basidiomycete, basidia begin to develop on the edges along the gills inside the cap. The basidia eventually develop into full-grown spores and wait to be liberated from the cap.

3. The Mushroom Growing Kit (kits are available for purchase at many online vendors for about \$20). Purchased prepared compost from a garden store will also easily and simply grows mushrooms. Mushrooms should grow in about 2 weeks.

The growing kit is the simplest way for your students to see how mushrooms, as fungi, decompose organic material. Follow the instructions in the kit for set-up and care and create a classroom watering schedule. (Note that you must allow 2-3 weeks for the fruiting bodies to develop.) Have your students complete the Observation Worksheet or create an observation notebook for each student.

*** If a mushroom growing kit is not available, or otherwise not feasible, this activity can be replaced with a visit to one of many websites that depict how fungi decay dead wood including The Field Museum's Underground Adventure website www.fieldmuseum.org/ua.

Culminating Performance Assessment:

What? Pre-fieldwork Research

Why? Up to this point students have learned the basics about how and why mycologists study mushrooms. Before any scientist goes out to conduct fieldwork, they always do their background research and develop a hypothesis about what they are going to find.

How?

1. Begin by having students review the [About the Expedition](#) section of the website. This section will explain what the research crew already knows about the research site and what they are trying to find out.
2. Brainstorm with the class the types of mushrooms or fungi that grow around the school. If you can't come up with specific names, it's okay, just describe or draw them. Contact the Illinois Department of Natural Resources for a free mushroom poster at <http://dnr.state.il.us/lands/education/habitatposter/fungi.htm> or try Dr.

Mueller's website at

http://www.fieldmuseum.org/research_collections/botany/botany_sites/sniif/localfungi.htm

3. Expand on this knowledge by having the students complete the Ecoregional Survey in groups of four. Give them at least overnight to complete the survey. Instruct them to use as many different resources in order to get the most accurate information. There are several books listed in the Resources section as well.
4. Discuss the results of the survey. How extensive were the results of the class's survey? (Did groups find different species?) Which resources were the most helpful? Did anyone find an estimate of how many species there are in the area?

Modifications:

- A) Turn the ecoregional survey into a trivia game! This requires more research on your part – The Resources section will help you find these answers, or go back to the Department of Natural Resources website.
- B) Offer the survey as multiple choice- giving students direction to look for answers.
- C) Develop flash cards with answers on back and have students quiz on another.

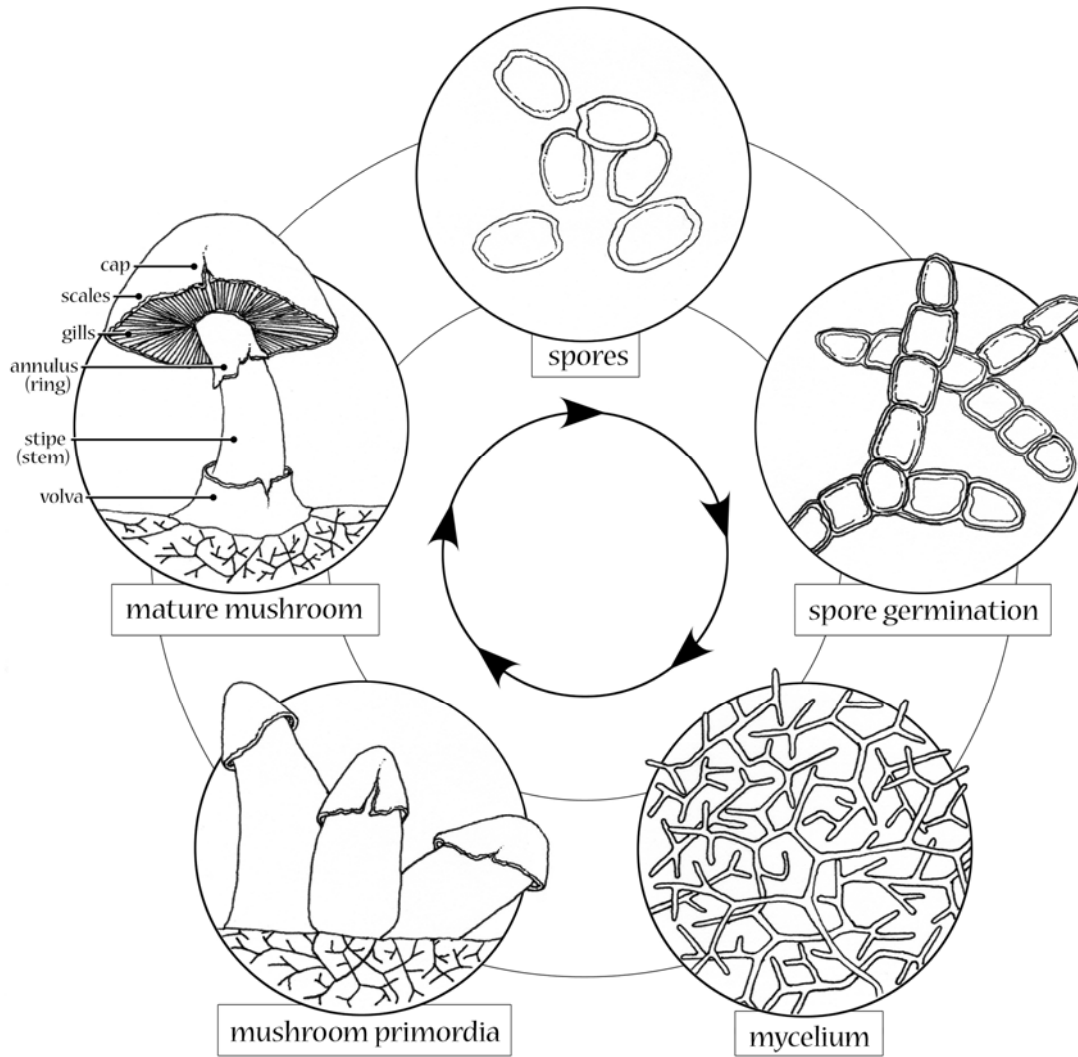
Assessment Codes: WS, CP

Credits:

Western Montana Mycological Society

Illinois Biodiversity Basics, adapted from Biodiversity Basics, a publication of the World Wildlife Fund's *Windows on the Wild* biodiversity education program

The Life Cycle of the Mushroom



HOW TO TAKE A SPORE PRINT

Begin by using a fresh, store bought mushroom. It's best to use one that's not too dried out or mushy.

1. Remove the mushroom's stem and place the mushroom with the gills side down onto a piece of white paper (you can even use the back of this sheet).
2. Cover the mushroom with a bowl, or anything that will keep out the wind. Even the tiniest breeze can blow the microscopic spores away.
3. WAIT – at least 4-6 hours for the spores to drop onto the paper. Don't move the paper or bowl in the meantime.
4. Check the paper for the spore print. Some mushrooms have white or crystal-looking spores that are hard to see in the light. Try holding the paper at an angle in a bright light. Spray the paper with hairspray or cover with plastic wrap to keep the print intact.
5. Write the common name and species name of your mushroom on your print.

MUSHROOM OBSERVATION WORKSHEET

Enter the date that you began observing the growing kit: _____

Please describe the kit on this day. Include the color of the soil, any organic material that is present, textures, smells, etc.

Outline the Mushroom Kit care schedule:

WEEK	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
1					
2					
3					
4					

Your kit should be monitored every few days for changes. Record the changes in the chart below:

	Week One	Week Two	Week Three	Week Four
Description?				
Any mycelium visible?				
Any fruiting bodies visible?				
Description of mushroom?				
What type of mushroom?				

ECOREGIONAL SURVEY

1. What major habitat do we live in? (temperate rainforest, grassland, tundra, etc.)
2. Name three native trees that live in our area.
3. How much average rainfall does our community get each year?
4. During what season (or month) does our community get the most rain?
5. How long is the growing season in our community?
6. What are some natural signs in our community that the seasons are changing?
7. Are there any threatened ecological areas in our area? Name the closest.
8. Name 5 species of mushroom or other fungi that grow in our area.
9. What is the food source for each of the above species?
10. Are any of the above species a non-native species?