Add the MIGHTY MUSHIE

Mushrooms, Foods Webs and Energy Flow

TEACHER GUIDE

LESSON 2

YEAR 7–8

This resource has been developed by:

Primary Industries Education Foundation Australia

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AMGA Australian Mushroom Growers' Assoc.

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LESSON 2

Mushrooms, Foods Webs and Energy Flow

LEARNING AREA/ YEAR LEVEL

Science (Year 7–8)

AUSTRALIAN CURRICULUM CONTENT

Use models, including food webs, to represent matter and energy flow in ecosystems and predict the impact of changing abiotic and biotic factors on populations (**AC9S7U02**)

Develop investigable questions, reasoned predictions and hypotheses to explore scientific models, identify patterns and test relationships (**AC9S7I01**, **AC9S8I01**)

Select and use equipment to generate and record data with precision, using digital tools as appropriate (**AC9S7I03**, **AC9S8I03**)

Select and construct appropriate representations, including tables, graphs, models and mathematical relationships, to organise and process data and information (**AC9S7I04**, **AC9S8I04**)

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Contents

LESSON OBJECTIVE

Students will learn about:

- The role of fungi/mushrooms in the environment.
- How energy flow within an ecosystem is related to fungi/ mushrooms.
- The relationship between mushrooms and abiotic and biotic factors.

ATTRIBUTION, CREDIT & SHARING

Primary Industries Education Foundation Australia's resources support and facilitate effective teaching and learning about Australia's food and food industries. We are grateful for the support of our industry and member organisations for assisting in our research efforts and providing industry-specific information and imagery to benefit the development and accuracy of this educational resource.

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Resources and Equipment

1. Ball of string and scissors
2. **Stimulus 1 – Food Chains**
3. **Stimulus 2 – Food Webs**
4. Access to laptop/digital devices
5. **Worksheet 2.1 – Food Chains/Webs Keyword**
6. **Worksheet 2.2 – Simple Food Web**
7. **Stimulus 3 – Fungi in Ecosystems**
8. **Stimulus 4 – Fungi Poster Ideas**
9. **Stimulus 5 – Mushrooms and Energy**

Background Information

Within ecosystem cycles, fungi can be broadly classified into three categories:

1. Decomposers
2. Mycorrhizal fungi
   a. Ectomycorrhizae
   b. Arbuscular mycorrhizae (symbiotic root fungi in relationships with plants)
3. Endophytes (living inside of and benefiting living plants)

Lesson Guide

Students will:

- Create a flowchart poster (online design program) showing the role of mushrooms within an ecosystem.
- Add the features of energy flow that relate to mushrooms on their flowcharts.
- Research the biotic and abiotic factors within an environment that promote optimal mushroom growth and development.
- Complete a series of problem solving activities focused on changing abiotic and biotic features and the effect on mushroom growth.

STARTER:

Begin by modelling a food chain and a food web with a ball of string. In this model, the string represents the flow of energy between organisms.

1. Organise the classroom and students so that they are in a closed circle.
2. Ask the students to think of an example of a food chain. If they are unable to come up with a food chain, provide them with **Stimulus 1 – Food Chains**.
3. Cut a length of string approximately 4 metres in length.
4. Discuss with students how most food chains begin with the sun as a source of energy.
5. Using the food chain example from step 2, give the ball of string to a volunteer who will be the first organism in the food chain, also known as a producer.
6. Students then pass/throw the ball of string to the next volunteer (acting as the second organism in the food chain), known as a primary consumer and a herbivore.
7. The string is then passed to one or two more volunteers modelling secondary and tertiary consumers respectively, and are commonly carnivores.
8. Discuss with students that the string, which represents the flow of energy, has 'run out'. This can lead to a discussion about how the transfer of energy between trophic levels is only about 10% efficient.
9. To model a food web, use **Stimulus 2 – Food Webs** to help students with the idea of a food web.
10. Using a long ball of string, pass the ball to a volunteer to act as the primary producer (the organism that converts the sun's energy into complex carbohydrates through photosynthesis).

11. Encourage students to then pass the ball of string to other students who represent primary, secondary, and tertiary consumers and decomposers.
12. Students will have created a 'string food web' showing the flow of energy in an ecosystem.
13. Discuss with students, what would happen to the food web if there was a storm or a severe drought (abiotic disruption)? *Parts of the food web can be disrupted that then affects other organisms*.
14. Demonstrate what can happen when biotic factors, such as disease, disrupt a food web by cutting the string that connects the affected organism, e.g. bird populations decline due to an avian flu.
15. Discuss with students, what would happen in the ecosystem if the decomposers, such as fungi and bacteria, were removed? *Dead organic matter would not be decomposed and would not get recycled into the ecosystem*.

MAIN:

a) Energy in ecosystems

1. Distribute copies of **Worksheet 2.1 – Food Chains/Webs Keywords**.
2. Having completed the starter activity, students may need consolidation on keywords that have been introduced. Students match the keywords to the correct definitions. One has been provided as an example.

   Answers

b) Classification of fungi

1. Distribute copies of **Worksheet 2.2 – Simple Food Web**.
2. To consolidate students' understanding of keywords associated with food chain webs and energy flow, students complete the cut and paste activity. Students organise the trophic levels on the left hand side and then place the organisms into the correct boxes in the simplified model food web.

   Answers

c) Food chains and webs games (optional)

1. There are several good web based games on food chains and webs. A quick search for 'food web game' will yield many results. The following game is highly recommended as it includes all the types of organisms required for a healthy ecosystem, but does require the need to create an account.
   - https://www.legendsoflearning.com/
   - Search for 'biosphere architect'

d) Flowchart poster

1. Remind/introduce to students that fungi play a pivotal role in the recycling of nutrients and energy in an ecosystem.
2. Show students the following videos to spark their curiosity about the role that fungi play in the environment.

   - Fungi and the Wood Wide Web (5:00)
   - How trees secretly talk to each other (1:48)
   - Decomposing fungi (1:48)
   - Mushrooms: diligent decomposers (1:09)

3. Distribute copies of, or share digitally **Stimulus 3 – Fungi in Ecosystems**. Discuss with students what each picture shows and how this relates to energy flow in an ecosystem.
4. Distribute copies of, or share digitally **Stimulus 4 – Fungi Poster Ideas**. Students research the main roles that fungi perform in an ecosystem. Once completed, they compile the information into a poster/infographic. This may be in a digital format or hard copy. Areas that the students should include are the following:

   - **Fungi as mycorrhizae** – stimulus suggestion: Fungi and the Wood Wide Web (5:00). Fungi have established a symbiotic relationship with up to 90% of plants. Mycorrhizal fungi form a network with plant roots. The fungi provide nutrients such as nitrogen and phosphorus to the plant in exchange for complex carbohydrates which the plant produces via photosynthesis.
   - **Fungi as decomposers** – stimulus suggestion: search an appropriate video of a timelapse of organic matter going mouldy. Fungi produce enzymes that are capable of breaking down both plant and animal material to obtain energy (saprophytic). This decomposition also provides nutrients for micro and macro-organisms and recycles them into the soil for future use.

5. *Teaching note: Remind students that mushrooms are the fruiting body of some types of fungi. Other types of fungi, such as yeasts, do not produce mushrooms.*

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e) Mushrooms and energy efficiency/sustainability

1. Distribute copies of, or share digitally **Stimulus 5 – Mushrooms and Energy** for students to learn more about how mushrooms are produced, including the energy requirements of mushroom production and how it is considered a highly sustainable industry. Share the following links with the students or have them scan the QR codes on the worksheet to learn more about mushrooms, energy and sustainability.
   - Mushroom sustainability
   - Biological efficiency of mushroom growing
2. Students complete a research task on the ideal biotic and abiotic features that promote optimal growth and development of mushrooms. Students may be given several options for how to report on their research. For example: creative writing, infographic, poster, news article, and social media posts.

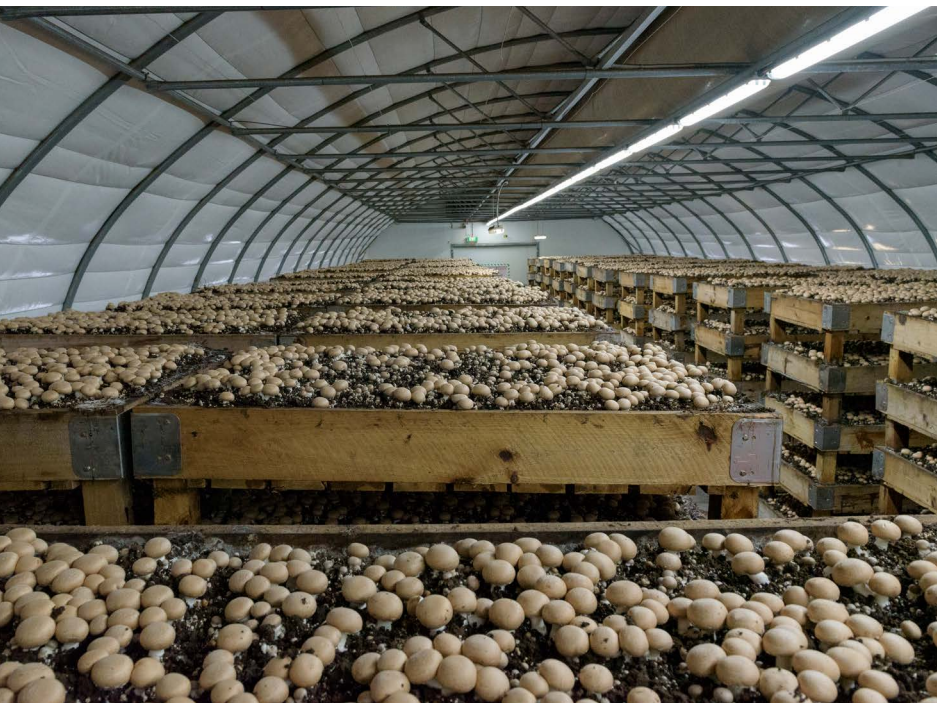
PLENARY:

Finish the lesson with a class discussion about the roles that fungi play in the environment. Suggested questions include:

1. How are nutrients recycled in nature?
2. What happens to living matter when it dies?
3. What would happen if there were no organisms to decompose dead material?
4. What roles do fungi play in ecosystems?
5. How do fungi get their nutrition?
6. What are mushrooms?
7. Where are mushrooms found?
8. What are the ideal biotic and abiotic factors for mushroom growth?

Student Resources

1. **Stimulus 1 – Food Chains**
2. **Stimulus 2 – Food Webs**
3. **Worksheet 2.1 – Food Chains/Webs Keywords**
4. **Worksheet 2.2 – Simple Food Web**
5. **Stimulus 3 – Fungi in Ecosystems**
6. **Stimulus 4 – Fungi Poster Ideas**
7. **Stimulus 5 – Mushrooms and Energy**



Answers

WORKSHEET 2.1 – Food Chains/Webs Keywords

Saprotroph	Obtains energy from decaying organic matter
Autotroph	Produces energy through sunlight or chemicals
Heterotroph	Obtains nutrients and energy from other organisms
Herbivore	Obtains energy through the consumption of plants
Carnivore	Consumes animals for energy
Decomposer	Breaks down dead material
Primary consumer	Second organism in a food chain/web
Producer	Converts sunlight into energy
Secondary consumer	Third organism in a food chain/web
Tertiary consumer	Fourth organism in a food chain/web
Omnivore	Consumes both animals and plants

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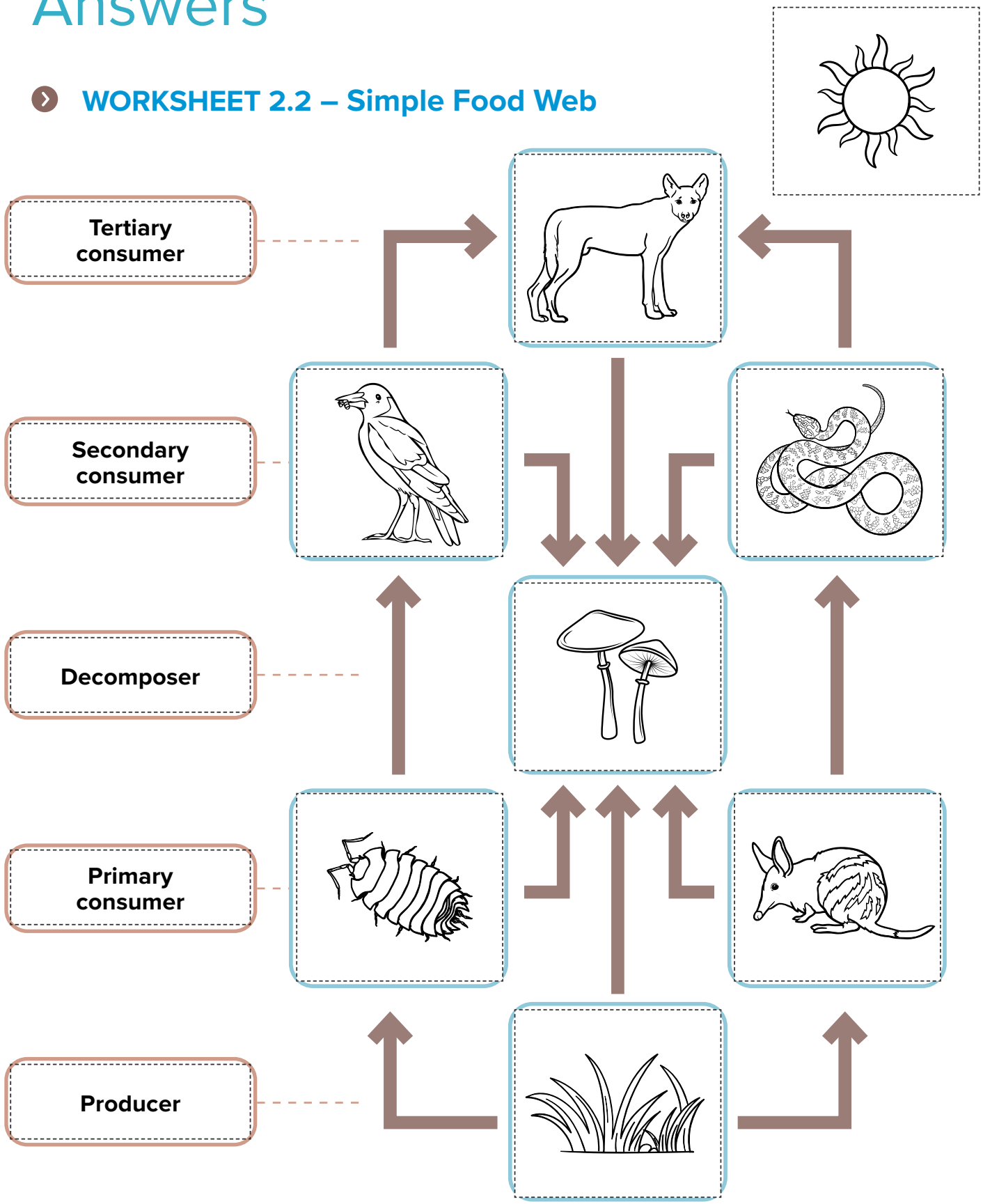
Answers

WORKSHEET 2.2 – Simple Food Web



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