

Lesson Plan

Assessment	AFL, questions
Cross-curricular	

Big Ideas

- Ecosystems are made up of biotic (living) and abiotic (non-living) elements, which depend on each other to survive.
- Ecosystems are in a constant state of change. The changes may be caused by nature or by human intervention.

Learning Goals

- Gaining understanding of intricate relationships between consumers, producers, and decomposers.
- To realize that ecosystems have limited capacity.
- Gaining understanding of the food web and that a break in it can lead to overpopulation or starvation and death.

Specific Expectations:

- 2.2** design and construct a model ecosystem.
- 2.4** use appropriate science and technology vocabulary.
- 3.1** demonstrate an understanding of an ecosystem as a system of interactions between living organisms and their environment.
- 3.3** describe the roles and interactions of producers, consumers, and decomposers within an ecosystem
- 3.4** describe the transfer of energy in a food chain and explain the effects of the elimination of any part of the chain

Description:

This is the **second** lesson in a five-lesson unit on ecosystems. The whole unit is based on the concept of playing a board game to learn about the interactions that occur in an ecosystem. Each day the rules of the game change as we focus on a different aspect. This second day we will focus on the food web.

Materials/Resources:

Game rules summary (see link)
 Game Pieces, includes board and cards (see link)
 Scissors
 Dice (one per student group)
 Playing pieces (e.g. Lego figures, or any other token you can come up with)

Safety Notes

Introduction

On this second day we will focus on the food web. The game now has a bit more complexity than on day one.

Recap from yesterday:

- Students learned about abiotic and biotic elements of ecosystems.
 - Who can think of some examples?
- Students also learned that biotic elements could be classified as producers, consumers and decomposers.
 - **Discussion questions:**
 - Who has some examples of each?
 - Can a lifeform be more than one of those? YES. Most things in fact play multiple roles. (Discuss some examples– e.g. a mushroom is a decomposer but can also be eaten, animals are consumers but are also consumed by other animals etc.)

The Food Web

As teachers discuss this section, they should write the name of each life form on the board. Then connect it with an arrow to any that it is related to (the arrow points from producer to consumer, and to decomposers).

- Every life form depends on other life forms for nutrition. List some examples.
 - Start with any life form (e.g. a fox). What is it? (Consumer)
 - What does it eat? (Rabbit)
 - What does the rabbit eat? (Grass)
- But the grass received nutrition from the soil, which was created by decomposers (e.g. microbes). They may have decomposed a fox at some point (draw all the relevant connection in).
- Add some other things a fox or rabbit might eat. You can quickly see that it starts to look like a web!
- All life forms depend on other ones. What would happen if, for example, rabbits became extinct?
 - Foxes might die.
 - Foxes might adapt and eat other things (but then there would be less of those – e.g. mice) for other life forms (e.g. hawks).

Balance in the Food Web

- Any ecosystem must have balance.
- What if there are too many producers? (E.g. too many rabbits for the foxes to eat? – overpopulation)
- What if there are too many consumers? (E.g. too many foxes – starvation and/or death)
- **So the goal of the game today is to achieve BALANCE.**

Students play the game to learn more about how this plays out in an ecosystem!

Action

Set up and rules for the Game

- Students cut out the cards needed for today (see Game Pieces link).
- Put cards in three piles: producers, consumers, and decomposers
- Explain the rules for today (see Summary link):
 - Today the game contains **three card types**: producers (green points), consumers (turn green points into red points), decomposers (erase red points).
 - Students will play three rounds and each time change things a bit.
 - There are **two types of points** – green and red. They represent production and consumption. If a student lands on a lot of production fields they will need a lot of green points.
 - When a student lands on a red field the card he/she will get will tell them that they **can convert some points from green to red**.
 - There is a third type of field – the decomposers. They **“erase” red points** – since decomposers help eliminate the waste that the consumers produce (e.g. feces).
 - To record points take a sheet with two columns – green points and red points. In each round students will adjust the points depending on the card they have drawn but following these rules:
 - Green points increase when you land on a green field.
 - Green points decrease and corresponding red point increase when you land on a red field.
 - Red points decrease when you land on a gray field.
 - After reading out a card players can put it back on the bottom of the pile they took it from.

Playing the Game

- For each round everyone starts with 3 green points and 3 red points.
- Play the game for a time set by the teacher in each round.
- Every player can choose a starting point. Roll dice and see where you land! Take turns...
- Everyone needs to keep track of their points as they go.
- If a player runs out of green points they are done and must sit out the rest of the round.
- **Round 1: Lots of Production**
 - Randomly place 22 green fields, 13 red fields, and 13 gray fields on the game path.
 - End of round discussion:
 - Who ended up with more green points than red ones? What does that mean? (Over production – e.g. too many rabbits)
 - Did anyone run out of green points? (It can happen but is not very likely)
 - **What would happen if a lot less were produced?** (Round 2)
 - Resources were limited and the ecosystem could not support all life forms.
 - What could lead to such breaks? (Human influence, natural disaster, disease, etc.)
 - In the next couple of days we will focus on two possible culprits: invasive species and humans.
- **Round 2: Lots of Consumption**
 - This time place 13 green fields, 22 red fields, and still 13 gray fields.

- End of round discussion:
 - Is it working out similarly to last time?
 - How do things balance in THIS ecosystem? (Now there is a lot more consumption)
 - Some players may not have been able to play the whole time.
- **Round 3: Break in Food Web**
 - Place 16 fields of each colour.
 - Play as before, BUT:
 - Teacher will suddenly give everyone a new special “break in the food web” card that **MUST** be picked up next. Follow instructions on card.
 - After card has been played – keep going and add another special card in a bit (there are three total).
 - End of round discussion:
 - What was the effect of the event on the ecosystem?
 - Does a missing link in the food web have large consequences? (It can especially when an animal loses two of its food sources, such as the bear who loses both berries and salmon in our game).
 - Discuss domino effect of losing phytoplankton especially.
 - What happened to your card deck? (Many consumer cards had to be removed)
 - The ecosystem loses diversity
 - Large predators are quite dependent on ALL links in the food web staying intact.
 - The loss of so many red cards represents the loss species when the food web breaks.
 - Discuss: What could lead to such breaks? (Human influence, natural disaster, disease, etc.)
 - In the next couple of days we will focus on two possible culprits: invasive species and humans.

Consolidation/Extension

Wrap up discussion questions:

- Over time ecosystems will balance out naturally. For example if there are too many rabbits they may eat all the available grass and start to starve. This may mean that fewer babies survive, and over time the rabbit population will drop again.
- Even if things balance out though, the ecosystem could be totally changed from before. Maybe all the foxes have disappeared and the rabbits are present in great numbers, leading to much less grass in the ecosystem.