

Lesson Plan

Assessment	AFL, questions
Cross-curricular	

Big Ideas

- Ecosystems are in a constant state of change. The changes may be caused by nature or by human intervention.
- Human activities have the potential to alter the environment. Humans must be aware of these impacts and try to control them.

Learning Goals

- To gain an understanding that resources are always limited
- Invasive species compete for resources with native species and often out-compete them.

Specific Expectations:

- 2.3** use scientific inquiry/research skills to investigate occurrences that affect the balance within the ecosystem (invasive species)
- 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
- 3.7** explain why an ecosystem is limited in the number of living things

Description:

This is the **third** 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 third day, students will focus on invasive species.

Materials/Resources:

Game rules summary (see link)
 Game Pieces, includes board and cards (see link)
 Scissors (one for each student)
 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 third day, students will focus on invasive species. The game is quite a bit different from the previous day as today players don't pick up any cards but compete for resources. Also, each player represents a life form today that is trying to survive in the ecosystem.

Brief Review

- Yesterday students looked at the food chain and how any breaks in it can have large consequences
- Students also saw that in a healthy ecosystem there is a balance between producers, consumers, and decomposers.
- **Discussion question:**
 - What were some of the things you learned from playing the game?

Invasive Species

- **Discussion questions:**
- What is an invasive species? (A species that is introduced into an ecosystem that it has not before been a part of. Invasive species can spread rapidly as they may not have any predators as they would in their home ecosystem).
- Can you think of any invasive species? (e.g. Zebra mussels, ladybugs, purple loosestrife, Asian carp, emerald ash borer)
- What do you think can happen when a new species spreads and multiplies rapidly?
 - They may eat foods of native species
 - Take over habitats of native species
 - Etc.
- We can call all things that an animal needs the “resources”. This can include many things, but in general any resource is limited.
- The game we will play today is designed to give you a sense of the impact invasive species have on an ecosystem.

Action

Setting up and rules of the Game

- Students cut out food and habitat resources paper squares and combine them with the green and gray paper squares you used in lesson 1. (See Game Pieces link)
- Students should have about 90 food resources and exactly 26 habitat resources. Keep the extra food resources in a baggie and add them to the “bank” (maybe a small box) as instructed as the game goes on.
- Students cut out rule reference cards (one of each kind for each group). This will make it easier for students to remember how to play the game.
- Overview
 - Each player chooses to be an animal in an ecosystem. One player is an invasive species.
 - As you move around your ecosystem you will consume resources (by rolling dice and according to rules for your species as given on the card)
 - Resources:
 - We have two types of resources: food and habitat

- Small cards that are found in the resource bank represent food. The bank has **10 food resources to start**. Every round, **6 food resources are added** to the bank as the ecosystem produces more.
- Small cards that are stored in a resource bank represent habitat but can also be taken by one player from another if the bank is empty. **The bank has 4 habitat resources to start.**

Playing the Game

- Randomly students pick an animal from the animal profile cards.
- Students place their token on the path of the game board (wherever they want to).
- Students take the number of habitat resources indicated on their card.
- Then students take turns, with the following order of Play:
 - **Add 6 food resources to food bank.**
 - **The player with the most habitat resources then takes their turn** followed by each other player in order of how many habitats they have (animals with large habitats can more easily control resources and consume them). If two or more players are tied in habitat number, roll a dice and the one with the highest roll goes first.
 - **NOTE: The order in which players take their turns can change on each turn with these rules!**
 - Each player does the following on their turn:
 - Roll dice and move along path.
 - Pick up food resources according to rules for their species.
 - If the food bank does NOT contain all the food you need, take what there is, **but you lose one habitat resource** no matter what you rolled. Place the habitat resource in the bank.
 - Pick up habitat according to rules for your species. **If the bank is empty the student can take a habitat resource from any other player EXCEPT from the invasive species.**
 - **NOTE:** If the student just lost a habitat due to lack of food, he/she still plays this part of their turn exactly the same way (so students could gain back a habitat or lose even more).
 - Once each player has completed their turn, add 6 food resources again, etc., etc.
 - The goal is to survive longer than anyone else.
 - A player is out if he/she drops to a habitat of zero.
 - The rest of the players keep playing, until one player remains. If it takes too long students can decide to quit before that.
- Time permitting; students play several rounds giving different students a chance to play the different animals.

Consolidation/Extension

Discussion

- How did it work out?
 - Note the following elements are built into the rules:
 - The gold fish starts with just a small foothold (one habitat resource), however:
 - It can never lose habitat after a full turn is complete. That's because it does not have any natural enemies and can therefore survive fairly easily.
 - In this way it gradually starts to take over.
 - The snail starts to lose habitat rapidly once the gold fish becomes more abundant. This is because the snail is a food source for the gold fish.
 - All the animals have to share a limited amount of food and habitat.
 - At the beginning there is some room to grow but pretty soon different animals start to take from each other.
 - Other fish can't take habitat from the gold fish because they are not its natural enemy. This gives the gold fish a huge advantage when competing for resources.
 - If there was no invasive species, on average food resources would be just enough for the other three. Adding the invasive species breaks the balance.
 - Some of these elements will become clear to the students, while others you may have to tease out a bit in the discussion.
 - The game is obviously not totally realistic, but it is designed to really give the students a feel for how an invasive species might take over a habitat.